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公告本

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發明 ~~新型~~ 專利說明書

一、發明 ~~新型~~ 名稱	中文	具有一降低剝離傾向之疊層吸收結構及產品及其成形方法
	英文	Process for forming laminated absorbent structures having reduced delamination tendencies
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	代表人姓名	駱喬爾 (Joel Rothfus)

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四、中文發明摘要（發明之名稱：具有一降低剝離傾向之疊層吸收結構及產品及其成形方法）

本發明利用一遮蔽帶連續、順暢的移動，將空氣攜帶的吸收材料，集中在移動中的纖維基層表面上。流經遮蔽帶開口區的空氣，將空氣中攜帶的材料，帶進纖維織料。纖維織料扮演過濾層，分隔氣流與其中攜帶的材料。大致上所有分佈的材料都被纖維織網截捕，所以可免去昂貴且複雜的吸收劑回收系統。

英文發明摘要（發明之名稱：Process for forming laminated absorbent structures having reduced delamination tendencies）

The present invention utilizes the smooth continuous motion of a masking belt to concentrate air entrained absorbent materials on the surface of a moving fibrous substrate. Air flowing through the open areas of the masking belt carries the entrained material into the fibrous web. The fibrous web acts as a filter to separate the entrained material from the air stream. Substantially all dispensed material is captured by the fibrous web, and expensive and complex absorbent material recycle systems can be eliminated.

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承辦人代碼：	A6
大　　類：	B6
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（由本局填寫）

本案已向：

美　　國（地區）　申請專利，申請日期：西元1994年12月7日　案號：08/350,920，□有　☑無主張優先權

有關微生物已寄存於：　　，寄存日期：　　，寄存號碼：

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經濟部中央標準局員工消費合作社印製

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五、發明說明（ 1 ）

發明範圍：

本發明有關具有降低剝離傾向之疊層吸收結構之形成方法，並有關以此方法製成之產品。此種方法在纖維基層中不連續的區域內數設額外的吸收性材料。

發明背景：

諸如尿片、成人尿失禁防護墊片、衛生棉墊及內褲襯墊等價廉吸收結構之製造商，愈來愈多人尋求使用疊層吸收結構以改進製造方法。這類疊層吸收結構的例子，在授予chinai等人的美國專利No. 4,023,570; 授予Seidy的美國專利No. 4,862,574；授予Luceri的歐洲專利申請案No. 597 273等，均有說明。這些結構併入通常以氣流成網纖維製成的吸收層，以形成連續的纖料。這些吸收層可提供產品主要的吸收能量，或者可用其他吸收材料補充。

因此，在疊層產品的吸收層加入額外的吸收材料，已日漸重要。粉狀、粒狀、微粒狀及短纖狀吸收材料之數設，其處理特別困難。數設這類額外材料的方法，包括授予Pelley的美國專利No. 5,213,817及授予Kock等人的美國專利No. 4,551,191。

Kock揭示的方法是在移動的多孔纖料上均勻分佈不連續的微粒。此方法包括：在移動的氣流中混合微粒，以提供均勻的分佈；然後沿著大致平行多孔纖料移動的方向，使微粒從噴嘴噴出。於是橫過多孔纖料建立一壓差，並維持在一與微粒噴嘴寬度一致的區域內。因此，所噴出的微粒大致均勻地沉著在移動的多孔纖料最上層表面。

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五、發明說明（ 2 ）

Pelley揭示一種可在移動的纖維基層上，間歇地數設微粒狀粉末材料的裝置。微粒是從一漏斗分配到氣流內，使微粒經由空氣攜帶，從一噴嘴送出。噴嘴是在第一與第二位置間振盪。在第一位置時，將微粒數設到移動基層上預定的位置。在第二位置時，微粒重新循環回到微粒進給斗。然而，爲了控制在纖維基層上不連續部份數設額外的吸收材料，仍需進一步的改進。

本發明目的之一在於提供一種方法，可在移動中的纖維基層上，不連續的填充區與空白區內，順暢地置放吸收材料。本發明另一目的在於增加設備的輕便，提供高速的式樣成型，並在移動中的纖維基層上，提供可反覆的、一致的吸收材料分佈式樣。

發明概要：

本發明利用一數設帶連續、順暢的移動，將空氣攜帶的吸收材料，集中在移動中的纖維基層表面上。流經數設帶開口區的空氣，將空氣中的材料，帶進纖維織料。纖維織料扮演過濾層，分隔氣流與其中攜帶的材料。

依照本發明，可以製造改進的疊層吸收結構。本發明有關一種連續方法，可形成具有降低剝離傾向之疊層吸收結構。實施本發明時，須移動一條纖維基層。此纖維基層具有二側邊，一縱軸，一第一主表面，及一與第一主表面相反之第二主表面。第二主表面由一覆蓋層定義。纖維基層移經一製作區域，此區域具有橫貫移動中纖維基層之壓差。在此區域中，作用於第一主表面的液壓大於作用於第二

（請先閱讀背面之注意事項再填寫本頁）

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五、發明說明（3）

主表面的液壓。因此，空氣被吸進穿透基層。在空氣被吸進穿透基層的同時，第二主表面至少有一部份是覆蓋的，阻止氣流通過；第一主表面上則對應第二主表面未覆蓋部份的式樣，提供計量的吸收材料。吸收結構至少有一部份可加大密度，使吸收材料可容置在產生的吸收結構內。其他製程步驟可包括：在第一主表面數設黏劑，以供更多疊層形成，或供摺疊纖維基層。

本發明可產生的產品之一是具有降低剝離傾向之疊層吸收結構。此種結構包括一纖維基層。此纖維基層具有第一主表面及與第一主表面相反之第二主表面；第二主表面係由一覆蓋層定義。纖維基層第一主表面上，至少有一部份黏有某種黏性成份，吸收材料則至少局部受黏性成份固定，且在纖維基層第一主表面上少於100%的面積內，形成至少一個不連續的包含吸收材料區與至少一個不含吸收材料區。藉由覆蓋層及纖維基層上至少一個不含吸收材料區內的至少一處周緣加密，而將吸收材料容置在吸收結構內。纖維基層可以摺疊以完全包圍吸收材料，或者可用額外的疊層覆蓋。由於加密區域大致不含吸收材料，所以，當此材料吸收大量液體而膨脹時，較不可能剝離。

圖式簡要說明：

圖1爲一側立面圖，顯示本發明之製造方法。

圖2爲一側立面圖，顯示本發明之製造中使用的形成室。

圖3爲圖2中沿3-3線之剖視圖，顯示本發明使用之分

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五、發明說明（4）

佈噴嘴、纖維基層及遮蔽帶間的關係。

圖4爲本發明吸收產品一實施例之外觀圖。

圖5爲圖4中沿5-5線之剖視圖，顯示本發明呈C形摺疊之產品。

圖6爲圖4中沿6-6線之剖視圖，顯示大致不含吸收材料的加密區。

圖7爲本發明吸收產品一實施例之外觀圖。

圖8爲圖7中沿8-8線之剖視圖，顯示本發明之疊層產品，其中具有大致不含吸收材料之加密區。

較佳實施例詳細說明：

本發明利用一遮蔽帶連續、順暢的移動，將空氣攜帶的吸收材料，集中在移動中的纖維基層表面上。流經遮蔽帶開口區的空氣，將空氣中的材料，帶進纖維織料。纖維織料扮演過濾層，分隔氣流與其中攜帶的材料。

請參閱圖1至圖3，本發明有關一種形成吸收結構之方法。實施本發明時，從一供料輥(12)拉出纖維基層(10)，置於移動的載料網屏(14)上。較佳是纖維基層(10)包括一覆蓋織料層及一氣流成網纖維層。載料網屏(14)在一遮蔽帶(16)上方移動，遮蔽帶(16)設有空洞區(18)與遮蔽區(20)。基層(10)、載料網屏(14)及遮蔽帶(16)隨後移動進入一形成站(22)。

形成站(22)包括一形成室(24)、一吸收材料供應噴嘴(26)及一真空室(28)。形成站(22)也可包括一空氣供應源(30)，以於形成室中維持控制下的大氣壓力；另可包括一

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五、發明說明（ 5 ）

感應器(32)，用以監測此壓力。材料供應噴嘴(26)係經由諸如風管(36)而接於吸收材料供料槽(34)，藉以產生作用。

在較佳實施例中，供料槽(34)經由一螺旋鑽(40)將吸收材料輸送到一供料斗(38)內。吸收材料被吸入一卡德里管(42)，使材料由氣流載送。由空氣攜帶的材料通過風管(36)被送達供應噴嘴(26)。空氣攜帶的材料被吸引從供應噴嘴(26)經過形成室(24)而以不連續的圖案，落在移動的纖維網(10)上。吸收材料沉著的圖案對應遮蔽帶(16)的空洞區(18)。由於形成室(24)與真空室(28)之間有大氣壓力差，所以會產生此種現象。因此，空氣易於流經纖維織料(10)上對應遮蔽帶(16)空洞區(18)的部份。接著，纖維織料(10)易於截捕空氣攜帶的材料，在其上產生沉著吸收材料的不連續區域。

本發明之形成站(22)大爲減少從移動的織料(10)帶通的吸收材料量。因此，本發明之方法中，不須回收吸收材料。吸收材料回收系統通常是現有微粒吸收劑分佈系統中的處理與維護難題。本系統的機械複雜性已大爲降低。然而，若是希望的話，本發明之方法中亦可加入回收系統。

纖維織料(10)從形成站(22)繼續前進，作進一步的處理，諸如，於折疊站(44)折疊纖維基層(10)，設設阻擋層(46)，於加密站(48)在纖維基層(10)中對應遮蔽帶(16)遮蔽區(20)的區域增加密度，以於產生的吸收產品中包含吸收材料，以及從連續的織料(10)裁切出個別的吸收產品(圖中未示)

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五、發明說明（ 6 ）

。這些處理的操作，是此種技術範疇中具備一般技能者所熟知的。

更詳細地說，於折疊站(44)中，移動的織料(10)的側邊(45)可平行織料之縱軸而折疊。較佳是，兩側邊(45)都如此折疊，而在縱軸上交會，以完全包圍移動織料(10)上沉著吸收材料的第一主表面。這個處理可稱爲C 形折疊處理。

在阻擋層(46)站，可用熱熔性壓敏黏劑(PSA)連續披覆成卷的離形紙。使這種定位黏劑接觸阻擋層，並夾壓此結構以將黏劑移轉到阻擋層(46)。離形紙的相反側隨後披覆一層結構黏劑，較佳是另一層熱熔性PSA，同時，將阻擋層(46)黏到移動的織料(10)。

另一種操作方式可包括：於一黏劑站(50)上，在移動的織料(10)上數設黏劑圖案。此種圖案可用來局部固定吸收材料於產生的吸收結構內，並協助固緊其他層與纖維織料(10)（諸如額外的不織布層），或用在上述的C 形折疊處理中。此種黏劑圖案可爲細線條、較寬的長條、擺線形圖案、圓點、細枝狀花紋等。較佳之黏劑圖案是授予Boger的美國專利No. 4,815,660中揭示的擺線形圖案。

形成室(24)中的選用性壓力感應器(32)可用來控制選用性的空氣供應源(30)，以於形成站(22)內橫跨移動的織料(10)維持連續的壓差。由於形成室(24)、移動織料(10)與真空室(28)之間沒有實體的密封，所以特別有用。如果成形室(24)內的氣壓太低，空氣可能會漏進成形室(24)。如果空氣流入成形室(24)的速度太大，當織料(10)在成形室(24)中

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五、發明說明（ 7 ）

時，其上沉著的吸收材料可能受到干擾。如果形成室(24)中的氣壓太高，載有吸收材料的空氣可能會漏出形成室(24)，使形成站(22)外部有令人討厭的吸收材料粉塵。因此，形成室(24)中的氣壓略低於形成室(24)外部的大氣壓力時，頗有益處。因此，可使溢出效應降至最低。

本發明的方法可用來生產多種不同的吸收產品。這些產品的例子包括內褲襯墊，衛生棉墊，尿失禁裝置，尿片，吸收墊片與襯墊等。圖4～6及圖7～8分別圖示這些產品的二個實施例。

請參閱圖4至圖6，其中顯示一C 形折疊的吸收產品(100)，產品中分佈了吸收材料(102)。吸收產品(100)包括一吸收結構(104)，此結構包括一覆蓋層(106)，一纖維層(108)及一結構黏劑(110)。吸收結構(104)可黏附在一阻擋層(112)；阻擋層(112)之面向衣物表面(116)上設有定位黏劑(114)。定位黏劑(114)可用離形襯紙(118)保護。

產品(100)之二縱向末端(120)上，各設有加密區域(122)。加密區域(122)大致不含吸收材料。"大致不含吸收材料"係表示這些區域內的吸收材料量，不足以在產品吸收的液體呈飽和狀態時，讓吸收材料造成疊層失效。較佳是，這些加密區域(122)內的吸收材料(102)少於每平方公分1 毫克(1 mg/cm^2)左右，更佳是，少於0.4 mg/cm^2 左右，最佳是，少於0.03 mg/cm^2 左右。如果加密區域內的吸收材料太多，產品可能會在飽和時剝離。從圖中可以看出，覆蓋層(106)與加密區(122)將吸收材料(102)完全容置在吸

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五、發明說明（ 8 ）

收產品(100)內。如此可減少產品(100)在使用前的加工、運輸及處理中，損失一般頗昂貴的吸收材料(102)。

纖維基層(104)可有一層覆蓋層(106)與一層纖維層(108)。覆蓋層(106)可爲不織布，諸如紡合織物，熱黏合織物、樹脂結合織物等；或爲含孔的薄膜，諸如DRI-WEAVE，RETICULON等；或爲使用氫結合形成的加密頂層，或爲其他任何適合的表面。纖維層(108)可由纖維素纖維構成，包括木漿與棉漿；或可由合成纖維構成，包括聚烯煙，聚酯及混合纖維；或由其他纖維構成。授予Cancian等人的美國專利No.4,592,943；授予Mays等人的美國專利No. 4,713,134；授予Mays的美國專利No. 4,787,947；授予Shimalla等人的美國專利No. 4,774,124；授予Luceri的歐洲專利申請案No. 597 273；以及Clark等人共同轉讓共同審理中的美國專利申請案No. 08/236,762；都揭示有用的吸收結構及頂端表面。其揭示內容併入此處作爲參考。

吸收材料(102)可由合成纖維形成，包括紡合纖維、熔噴精梳及結合人造短纖；或由纖維素纖維形成，諸如木漿、穩定化木漿、泥炭苔；也可用超吸吸收劑形成。有用的超級吸收劑包括聚丙烯酸酯；改質之天然及再生聚合物（諸如多醣類）；水膠（諸如改質之聚丙烯腈化合物）；交鏈非離子聚合物（諸如聚氧乙烯、聚氧丙烯及其混合物）；異丁烯-馬來酸酐共聚物之衍生物；諸如授予Le-Khac的美國專利Nos. 4,731,067; 4,743,244; 4,788,237; 4,813,945; 4,880,868; 4,892,533;及4,151,465中揭示

（請先閱讀背面之注意事項再填寫本頁）

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五、發明說明（ 9 ）

的共聚物。

吸收材料(102)較佳是超級吸收劑，更佳是一種超級吸收劑粉末，最佳是微粒狀聚丙烯酸酯鈉超級吸收劑—Aqua Keep J-550，可向Sumitomo Seika化學公司購得。吸收材料(102)可按需要數設在活動的織料上，以於形成的個別墊片上提供所要份量的吸收材料(102)。較佳是，數設的吸收材料(102)約爲每一墊片100～1000毫克(mg/片)，更佳是約爲200～800 mg/片，最佳是約爲400～600 mg/片。

阻擋層(112)可用棄置型吸收產品技術中有用的任何阻擋薄膜形成。有用的薄膜包括（但不限於）聚烯烴薄膜(諸如聚乙烯及聚丙烯）；聚乙烯化合物薄膜（諸如聚醋酸乙烯酯，聚氯乙烯及聚偏二氯乙烯）；共聚物薄膜（諸如乙烯-醋酸乙烯酯及上述聚合物一種或多種之混合物或疊層物）。較佳的阻擋薄膜包括乙烯-醋酸乙烯酯／聚乙烯疊層薄膜及聚丙烯薄膜。更佳的阻擋薄膜是聚烯烴（諸如聚乙烯）。

結構黏劑(110)與定位黏劑(114)的選擇，對本發明的實施並非緊要。這些黏劑可獨立選自溶劑釋出型(solvent-releasing)（例如：以乳劑或有機溶劑爲基礎型）；熱化型(curing)（例如：放射熱化、電子束、或催化熱化型）；或熱熔型者。較佳之黏劑包括熱熔黏劑，它也可以是壓敏黏劑(PSA)。代表性的（非限制性的）有用的黏劑清單中，包括以天然橡膠、苯乙烯／丁二烯乳膠、A-B-A塊狀共聚物、丁基橡膠與聚異丁烯、丙烯酸化合物（包括醋酸

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五、發明說明（ 10 ）

乙烯酯-丙烯酸酯共聚物）、乙烯醚聚合物、聚烯聚合物、聚胺酯、乙烯-醋酸乙烯酯共聚物及聚丙烯（包括無規立構聚丙烯）爲基礎的黏劑。較佳是，黏劑爲A-B-A塊狀共聚物、丙烯酸樹脂、或乙烯-醋酸乙烯酯共聚物。更佳是，結構黏劑係以A-B-A塊狀共聚物熱熔黏劑爲基礎，諸如National Starch #34-5539，而定位黏劑是A-B-A塊狀共聚物熱熔黏劑，諸如H. B. Fuller Co.的HL-1335。

黏劑可用一般業者所知的方式敷設到吸收墊片上。這些方法包括（但不限於）噴灑、轉印披覆、壓延披覆、槽孔披覆、凹版壓延等。

現在請參閱圖 7 至圖 8，其中顯示一疊層吸收產品(200)，產品中分佈了吸收材料(202)。吸收產品(200)包括一吸收結構(204)，此結構包括一覆蓋層(206)，一纖維層(208)及一結構黏劑(210)。吸收結構(204)可與一阻擋層(212)疊層結合；阻擋層(212)之面向衣物表面上設有定位黏劑(214)。定位黏劑(214)可用離形襯紙(218)保護。

產品(200)之周緣(220)上，有一加密區域(222)。此一區域(222)大致不含吸收材料。從圖中看出，覆蓋層(206)、阻擋層(212)及加密區域(222)將吸收材料(202)完全容置在吸收產品(200)內。如此可減少產品(200)在使用前的加工、運輸及處理中，損失一般頗昂貴的吸收材料(202)。

纖維基層(204)、覆蓋層(206)、纖維層(208)、阻擋層(212)、吸收材料(202)、定位黏劑(214)及結構黏劑(210)可選用上列材料。

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五、發明說明（ 11 ）

以上說明書及實施列係爲了協助完全了解其中揭示的發明，但非限制性的。由於本發明可有多種變化與實施例而不脫離其精神與範圍，所以本發明在於以下之申請專利範圍。

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六、申請專利範圍

1.一種具有降低剝離傾向之疊層吸收結構，該結構包括：

a)一纖維基層，具有第一主表面及與第一主表面相反之第二主表面，第二主表面由一覆蓋層定義；

b)一黏性成份，至少黏附於纖維基層第一主表面的一部份；以及

c)一吸收材料，至少局部受黏性成份固定，並呈圖案分佈，在纖維基層第一主表面形成至少一個不連續的包含吸收材料區，其面積小於第一主表面的100%；並形成至少一個不含吸收材料區；

其中，吸收材料至少由覆蓋層容置在吸收結構內。

2.如申請專利範圍第1項之結構，進而在至少一個不含吸收材料區內，至少包含一個纖維基層周緣加密部位。

3.如申請專利範圍第1項之結構，其中之纖維基層係本身對摺，藉此提供覆蓋層之外表面。

4.如申請專利範圍第1項之結構，其中有一包含層在第一主表面與吸收材料上方，以包含吸收材料。

5.如申請專利範圍第4項之結構，其中之包含層包括一不織布層。

6.如申請專利範圍第4項之結構，其中之包含層包括一阻擋層。

7.如申請專利範圍第1項之結構，其中之吸收材料呈圖案分佈，以於纖維基層之第一主表面內，形成不含吸收材料區。

8.如申請專利範圍第1項之結構，其中之吸收材料爲微粒

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六、申請專利範圍

狀超級吸收劑聚合物。

9.如申請專利範圍第1項之結構，其中之吸收材料爲纖維性超級吸收劑聚合物。

10. 如申請專利範圍第9項之結構，其中之纖維性超級吸收劑聚合物，其纖維長度小於大約1公分。

11. 一種具有降低剝離傾向之疊層吸收產品，包括：

a)一疊層吸收結構，具有二縱向末端、一縱軸及二側邊，此結構包括：

i)一纖維基層，具有第一主表面及與第一主表面相反之第二主表面；第二主表面由一覆蓋層定義；

ii)一黏性成份，黏附在纖維基層第一主表面至少一部份；及

iii)一吸收材料，至少局部受黏性成份固定，並呈圖案分，在纖維基層第一主表面形成至少一個不連續的包含吸收材料區，其面積小於第一主表面的100%；並形成至少一個不含吸收材料區，位於每一縱向末端；其中，纖維基層的側邊平行縱軸摺疊，以容置吸收材料，提供覆蓋層之外表面，並形成吸收結構；

b)一阻擋層，附接到吸收結構外表面的一部份；及

c)縱向端密封，其中，至少吸收結構不含吸收材料區加密，以進一步將吸收材料容置於吸收結構內。

12. 一種形成具有降低剝離傾向之疊層吸收結構之連續方法，包括以下步驟：

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六、申請專利範圍

a)提供一移動之纖維基層，此基層具有二側邊，一縱軸，一第一主表面，及一與第一主表面相反之第二主表面；第二主表面由一覆蓋層定義；

b)提供一壓差橫貫移動之纖維基層，其中，作用在第一主表面的液壓大於作用在第二主表面的液壓，藉此將空氣吸進穿透纖維基層；

c)遮蔽至少第二主表面的一部份，以阻擋氣流；

d)在第一主表面提供定量的吸收材料，呈現與第二主表面未遮蔽部份相對應的圖案；及

e)至少加密纖維基層對應遮蓋部份的一部份，以於側向上將吸收材料容置在所產生的吸收結構內。

13. 如申請專利範圍第12項之方法，其中，定量之吸收材料係在氣流中提供。

14. 如申請專利範圍第12項之方法，進而包括將纖維基層對摺之步驟，以提供覆蓋層之外表面。

15. 如申請專利範圍第14項之方法，其中，纖維基層之側邊平行縱軸而摺疊，以容置吸收材料，並提供覆蓋層之外表面。

16. 如申請專利範圍第12項之方法，進而包括一步驟，將一包含層置於第一主表面上方，以包含吸收材料。

17. 如申請專利範圍第12項之方法，進而包括在纖維基層第一主表面上至少一部份敷設一黏性成份。

18. 如申請專利範圍第17項之方法，其中係在敷設吸收材料前先敷設黏性成份。

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六、申請專利範圍

19. 一種形成具有降低剝離傾向之疊層吸收產品之連續方法，包括以下步驟：

a)提供一移動之纖維基層，此基層具有二側邊，一縱軸，一第一主表面，及一與第一主表面相反之第二主表面；第二主表面由一覆蓋層定義；

b)在纖維基層第一主表面至少一部份上，敷設黏性成份；

c)提供一壓差橫貫移動之纖維基層，其中，作用在第一主表面的液壓大於作用在第二主表面的液壓，藉此將空氣吸進穿透纖維基層；

d)遮蔽第二主表面上至少對應產品縱向末端之部份，以阻擋氣流；

e)在第一主表面提供定量的吸收材料，呈現與第二主表面未遮蔽部份相對應的圖案；

f)平行縱軸摺疊纖維基層之側邊，以容置吸收材料，提供覆蓋層外表面，以產生一吸收結構；

g)在吸收結構一表面附接一阻擋層；

h)至少加密纖維基層對應遮蓋部份的一部份，以於側向上將吸收材料容置在吸收結構內；及

i)在各個疊層吸收產品之縱向末端分割，使每一產品之縱向末端保留一加密部份。

323952 中華民國專利申請案第85104098號
ROC Patent Appln. No.85104098
中文圖說修正本 - 附件(一)
Amended Drawings in Chinese - Encl. I
(民國 86 年 1 月 24 日修正送呈)
(Amended & Submitted on January 24, 1997)

年1月24日修正補充

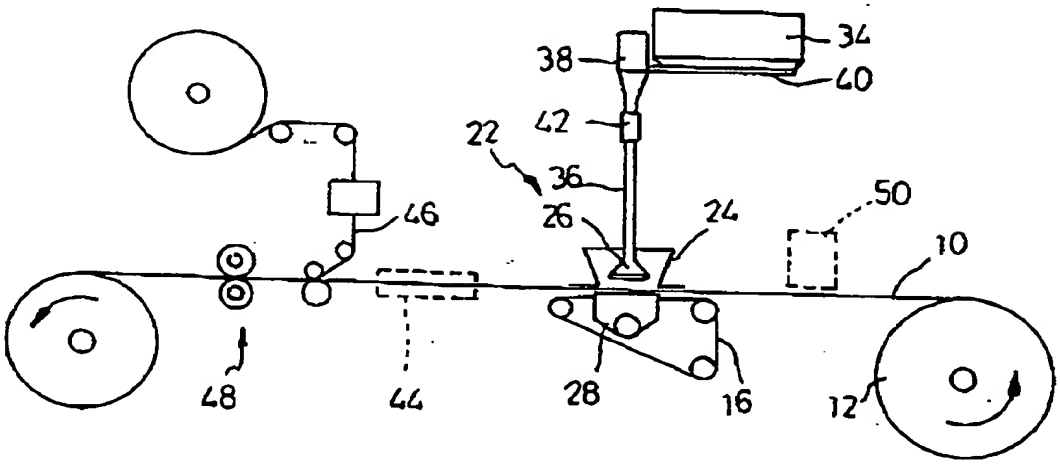

圖 1

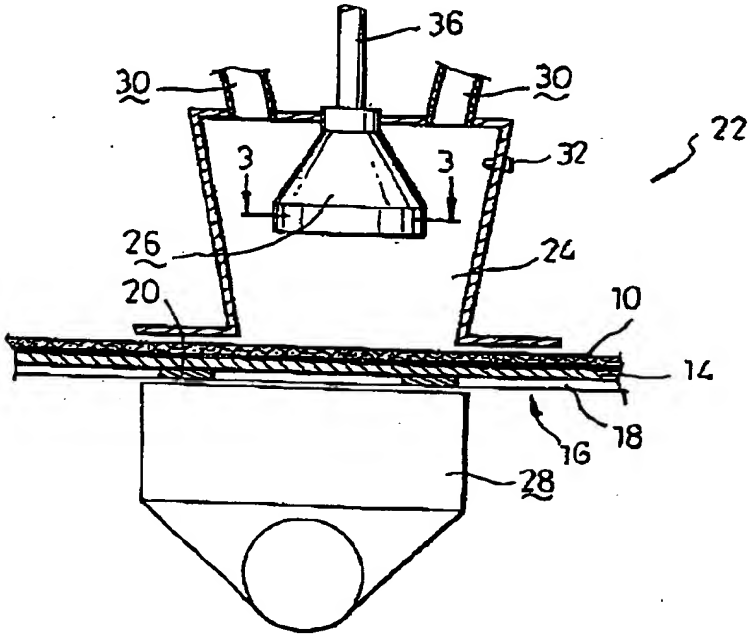

圖 2

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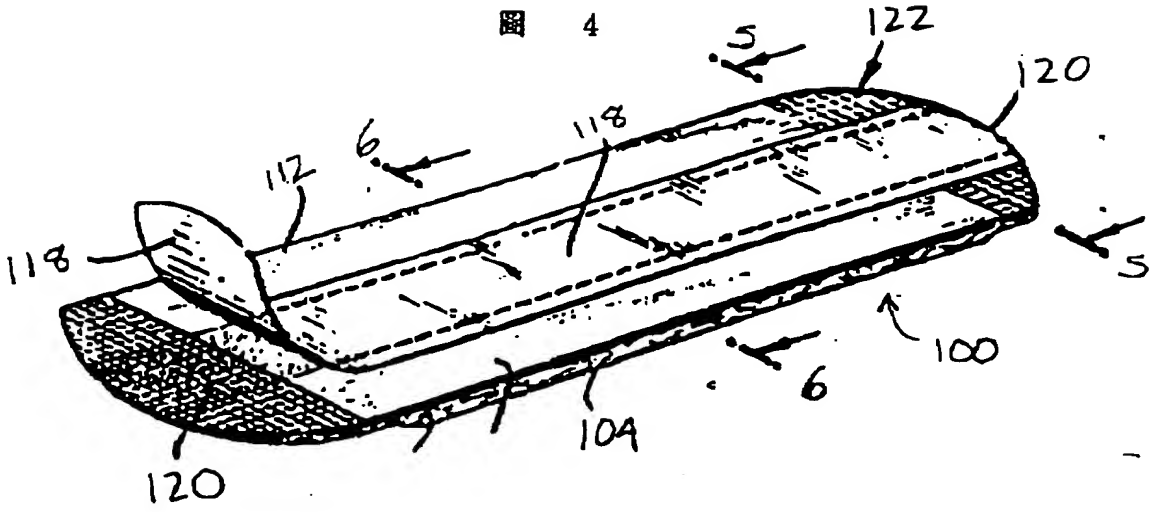
圖 4



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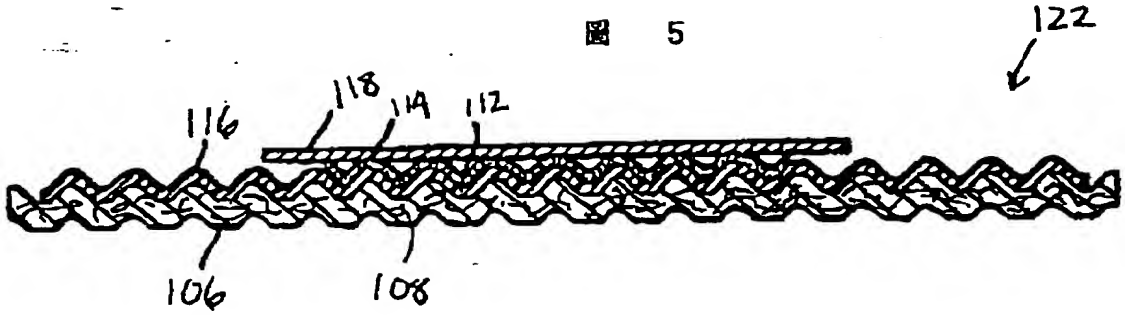

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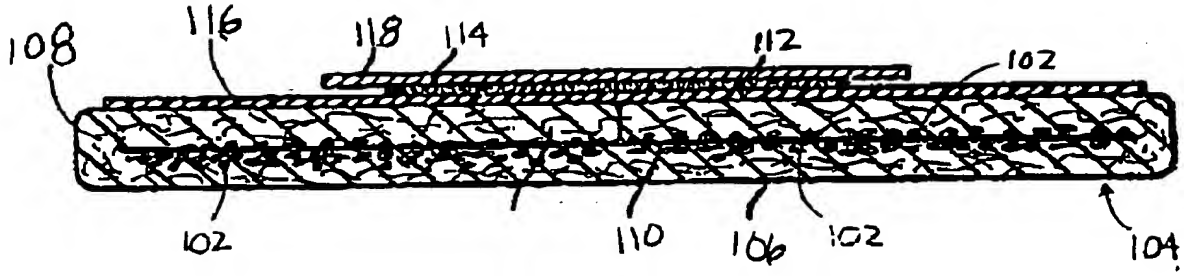

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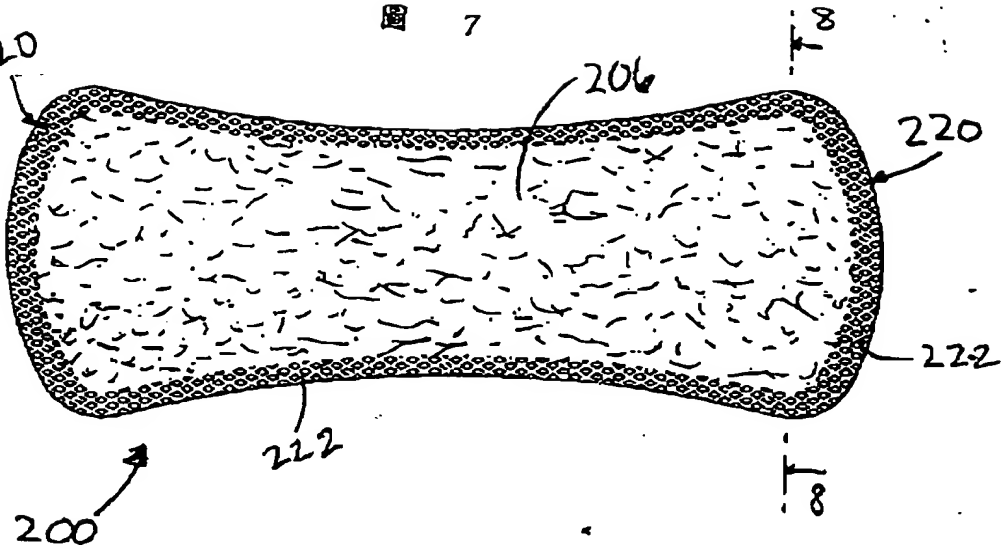
圖 7



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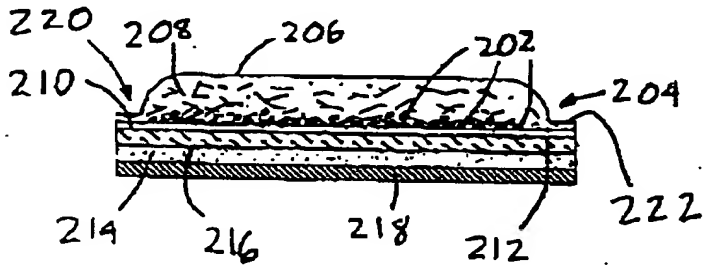
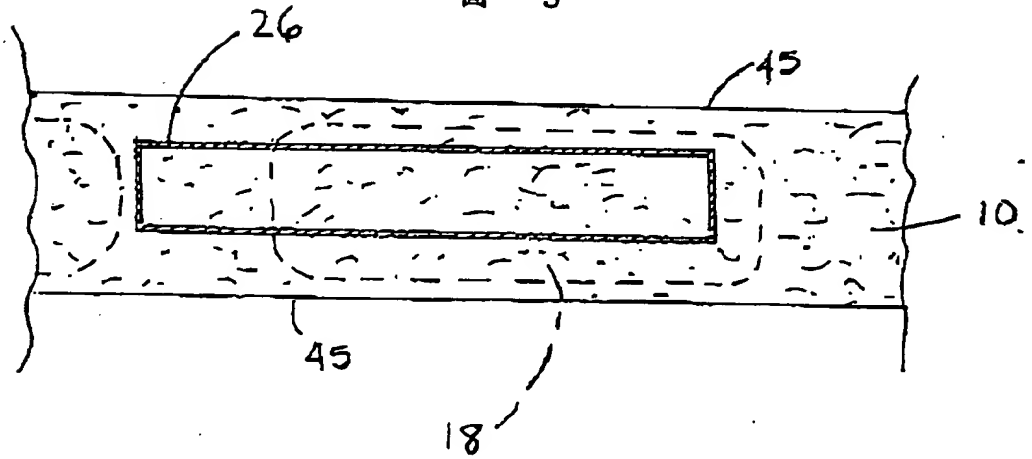


圖 3



PROCESS FOR FORMING LAMINATED ABSORBENT STRUCTURES HAVING REDUCED DELAMINATION TENDENCIES

Field of the Invention

The present invention relates to a process for forming laminated absorbent structures having reduced delamination tendencies and to products made by this process. The process provides for the application of additional absorbent material to a fibrous substrate in discrete zones. The resulting structures have improved integrity.

Background of the Invention

The manufacturers of inexpensive absorbent structures such as diapers, adult incontinence guards and pads, sanitary napkins, and panty liners are increasingly looking to the use of laminated absorbent structures to improve processing. Examples of such laminated absorbent structures are described in Chinai et al., U.S. Patent No. 4,023,570; Seidy, U.S. Patent No. 4,862,574; Luceri, EP-A-0 597 273; and the like. These structures incorporate absorbent layers which are generally made by air-laying fibers to form a continuous web. These absorbent layers may provide the majority of the absorbent capacity of the product, or they may be supplemented by additional absorbent materials.

Therefore, the incorporation of additional absorbent materials to the absorbent layers of laminated products is increasingly important. It is particularly difficult to manage the application of powdered, granular, particulate, and short fibrous absorbent materials. Examples of processes to apply such

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additional materials include Pelley, U.S. Patent No., 5,213,817, and Kock et al., U.S. Patent No. 4,551,191.

Kock discloses a method for uniformly distributing discrete particles on a moving porous web. It involves mixing particles within a moving airstream to provide a uniform distribution, and directing the particles out of a nozzle in a direction substantially parallel to the movement of the porous web. A pressure differential across the porous web is established and maintained in an area which coincides with the width of the particle discharge nozzle. Thus, the bulk of the discharged particles are substantially uniformly deposited onto the uppermost surface of the moving porous web.

Pelley discloses an apparatus for intermittently applying a particulate powder material to a moving fibrous substrate. Particles are dispensed from a hopper into an air stream. The resulting air-entrained particles are directed out of a nozzle which oscillates between first and second positions. In the first position, particles are applied to a predetermined location on the moving substrate, and in the second position, the particles are recirculated to the particle feed hopper. However, further improvements are needed to allow the controlled application of additional absorbent materials to discrete portions of a fibrous substrate.

An object of the present invention is to provide a process for smoothly depositing absorbent materials in a discrete pattern of fill and void areas onto a moving fibrous substrate. Another object of the present invention is to increase equipment simplicity, to provide high-speed pattern formation, and to provide repeatable, uniform patterns of absorbent material on a moving fibrous substrate.

Summary of the Invention

The present invention utilizes the smooth continuous motion of a masking belt to concentrate air-entrained absorbent materials on the surface of a moving fibrous substrate. Air flowing through the open areas of the masking belt carries the entrained material into the fibrous web. The fibrous web acts as a filter to separate the entrained material from the air stream.

Improved laminated absorbent structures can be manufactured according to the present invention. This invention relates to a continuous process for forming a laminated absorbent structure having reduced delamination tendencies. To practice this invention, one moves a fibrous substrate having lateral sides, a longitudinal axis, a first major surface, and a second major surface, opposite the first, the second major surface defined by a cover layer through a manufacturing zone having a pressure differential across the moving fibrous substrate. In this zone, the fluid pressure acting on the first major surface is greater than the fluid pressure acting on the second major surface. Thus, air is drawn through the fibrous substrate. While air is being drawn through the substrate, at least a portion of the second major surface is masked to prevent to air flow therethrough, and a metered amount of an absorbent material is provided to the first major surface in a pattern corresponding to the unmasked portion of the second major surface. At least a portion of the absorbent material can be densified to contain the absorbent material within the resulting absorbent structure. Additional process steps may include applying an adhesive to the first major surface to provide for lamination of additional layers or for the folding of the fibrous substrate.

One possible product of this invention is a laminated absorbent structure having reduced delamination tendencies. This structure includes a fibrous substrate having a first major surface and a second major surface, opposite the first, the second major surface defined by a cover layer. An adhesive composition is adhered to at least a portion of the first major surface of the fibrous substrate, and an absorbent material is at least partially immobilized by the adhesive composition and is disposed in a pattern to form at least one discrete absorbent material-containing zone which occupies less than 100% of the first major surface of the fibrous substrate and at least one absorbent material-free zone. The absorbent material is contained within the absorbent structure by at least the cover layer and at least one peripheral densification of the fibrous substrate in the at least one absorbent material-free zone. The fibrous substrate may be folded to fully enclose the absorbent material, or it may be covered by additional laminated layers. Because the densified areas are substantially free of the absorbent material, they are less likely to delaminate as this material absorbs substantial amounts of fluids and expands.

Brief Description of the Drawing

Fig. 1 is a side elevation illustrating the process of the present invention.

Fig. 2 is a side elevation of a forming chamber useful in the process of the present invention.

Fig. 3 is a view along line 3-3 of Fig. 2, illustrating the relationship between a dispensing

nozzle, a fibrous substrate, and a masking belt useful in the present invention.

Fig. 4 is a perspective view of one embodiment of an absorbent product of the present invention.

Fig. 5 is view along line 5-5 of Fig. 4, illustrating a C-folded product according to the present invention.

Fig. 6 is a view along line 6-6 of Fig. 4, illustrating a substantially absorbent material-free densification zone.

Fig. 7 is a perspective view of one embodiment of an absorbent product of the present invention.

Fig. 8 is view along line 8-8 of Fig. 7, illustrating a laminated product which has a substantially absorbent material-free densification zone according to the present invention.

Detailed Description of the Preferred Embodiment

The present invention utilizes the smooth continuous motion of a masking belt to concentrate air-entrained absorbent materials on the surface of a moving fibrous substrate. Air flowing through the open areas of the masking belt carries the entrained material into the fibrous web. The fibrous web acts as a filter to separate the entrained material from the air stream.

Referring to Figs. 1-3, the present invention relates to a process for forming absorbent structures. In the practice of the invention, a fibrous substrate 10 is unwound from a supply roll 12 onto a moving carrier

screen 14. Preferably, the fibrous substrate 10 includes a cover fabric layer and an air-laid fibrous layer. The carrier screen 14 moves over a masking belt 16 having void areas 18 and mask areas 20. The substrate 10, carrier screen 14, and masking belt 16 then move into a forming station 22.

The forming station 22 includes a forming chamber 24, an absorbent material supply nozzle 26, and a vacuum chamber 28. The forming station 22 may also include an air supply 30 to maintain a controlled atmospheric pressure in the forming chamber 24 and a sensor 32 to monitor this pressure. The material supply nozzle 26 is operatively connected to an absorbent material supply feeder 34 by means of, e.g., conduit 36.

In a preferred embodiment, the supply feeder 34 transfers absorbent material into a supply hopper 38 via a screw auger 40. The absorbent material is drawn through a venturi 42 to entrain the material in an air stream. The air-entrained material is delivered through the conduit 36 to the supply nozzle 26. From the supply nozzle 26, the air entrained material is drawn through the forming chamber 24 and onto the moving fibrous web 10 in a discrete pattern. The pattern of absorbent material deposition corresponds to the void areas 18 of the masking belt 16. This occurs as there is an atmospheric pressure differential between the forming chamber 24 and the vacuum chamber 28. Thus, the air will tend to flow through portions of the fibrous web 10 corresponding to the void areas 18 of the masking belt 16. Again, the fibrous web 10 will tend to catch the entrained material to result in discrete areas of the fibrous web 10 having the absorbent material deposited thereon.

The forming station 22 of the present invention greatly reduces the amount of absorbent material which by-passes the moving web 10. Thus, absorbent material need not be recycled in the present process. Absorbent material recycling systems are typically a process and maintenance problem in current particulate absorbent dispensing systems. The mechanical complexity of the resulting system is greatly reduced. However, if desired, a recyling system could be included in the present process.

From the forming station 22, the fibrous web 10 can continue on for further processing such as folding of the fibrous substrate 10 at a folding station 44, application of a barrier layer 46, densification of the fibrous substrate 10 in regions corresponding to the mask areas 20 of the masking belt 16 to contain the absorbent material within the resulting absorbent product at a densification station 48, and cutting individual absorbent products from the continuous web 10 (not shown). The operation of these processes is well known to those of ordinary skill in the art.

In further detail, the lateral sides 45 can be folded parallel to the longitudinal axis of the moving web 10 in the folding station 44. Preferably, both lateral sides 45 are folded and meet at the longitudinal axis to fully enclose the first major surface of the moving web 10 on which the absorbent material has been deposited. This can be described as a c-folding process.

In the barrier layer 46 station, a web of release paper can be continuously coated with a hot melt pressure sensitive adhesive (PSA). This positioning adhesive is brought into contact with the barrier layer 46, and the construction is nipped to transfer the

adhesive to the barrier layer 46. The opposite side of the release paper is then coated with a construction adhesive, preferably another hot melt PSA, and the barrier layer 46 is adhered and nipped to the moving web 10.

Optional operations may include applying an adhesive pattern to the moving web 10 at an adhesive station 50. This pattern can be used to partially immobilize the absorbent material within the resulting absorbent structure and to help to secure further layers to the fibrous web 10, such as additional nonwoven layers or in the c-folding operation described above. The adhesive pattern can be applied as thin lines, wider stripes, cycloid patterns, dots, a fibril spray pattern, and the like. A preferred adhesive pattern is applied in a cycloid pattern as described in Boger, U.S. Patent No. 4,815,660, herein incorporated by reference.

The optional pressure sensor 32 in the forming chamber 24 may be used to control the optional air supply 30 to maintain a continuous pressure differential across the moving web 10 in the forming station 22. This is useful as there is no physical seal between the forming chamber 24, the moving web 10, and the vacuum chamber 28. If the air pressure within the forming chamber 24 is too low, air may leak into the chamber 24. If the velocity of air flowing into the chamber 24 is too great, the absorbent material deposited onto the moving web 10 may be disturbed as the web 10 exits the forming chamber 24. If the air pressure within the forming chamber 24 is too high, absorbent material-laden air may leak out of the chamber 24, causing undesirable dusting of the absorbent material outside of the forming station 22. Therefore, it is helpful to have the air pressure in the forming chamber 24 slightly below

atmospheric pressure outside of the forming chamber 24. Therefore, the exiting effects would be minimal.

The process of the present invention can be used to produce several different types of absorbent products. Examples of such products include panty liners, sanitary napkins, incontinence devices, diapers, absorbent pads and liners, and the like. Two embodiments of these products are illustrated in Figs. 4-6 and 7-8, respectively.

Referring now to Figs. 4-6, there is illustrated a C-folded absorbent product 100 having an absorbent material 102 distributed therein. The absorbent product 100 includes an absorbent structure 104 having a cover layer 106, a fibrous layer 108, and a construction adhesive 110. The absorbent structure 104 may be adhered to a barrier layer 112 having a positioning adhesive 114 disposed upon a garment-facing surface 116 thereof. The positioning adhesive 114 may be protected by a release liner 118.

At the longitudinal ends 120 of the product 100, there are densified areas 122. These areas 122 are substantially absorbent material-free. By "substantially absorbent material-free", it is meant that there is not enough absorbent material in these areas to allow the absorbent material to cause a lamination failure as the product becomes saturated with fluids. Preferably, there is less than about 1 mg/cm^2, more preferably, less than about 0.4 mg/cm^3, and most preferably, less than about 0.03 mg/cm^2 of the absorbent material 102 in these densified areas 122. If there is too much absorbent material in the densified areas, the product may delaminate when saturated. It can be seen that the absorbent material 102 is fully contained within the absorbent product 100 by the cover layer 106

and the densified areas 122. This reduces loss of the generally expensive absorbent material 102 during the processing, shipping, and handling of the products 100 prior to use.

The fibrous substrate 104 may have a cover layer 106 and a fibrous layer 108. The cover layer 106 may be a nonwoven fabric such as a spunbonded fabric, a thermal bonded fabric, a resin bonded fabric, and the like; an apertured film such as DRI-WEAVE, RETICULON, and the like; a densified top layer formed with hydrogen bonding; or any other suitable covering surface. The fibrous layer 108 may comprise cellulosic fibers, including wood pulp and cotton pulp; synthetic fibers, including polyolefins, polyesters, and bicomponent fibers; and the like. Useful absorbent structures and top surfaces are disclosed in Cancian et al., U.S. Patent No. 4,592,943; Mays, et al. U.S. Patent No. 4,713,134; Mays U.S. Patent No. 4,787,947; Shimalla et al., U.S. Patent No. 4,774,124; Luceri, EP-A-0 597 273; and the commonly assigned, copending application, Clark et al., U.S. Serial No. 08/236,762; the disclosures of which are herein incorporated by reference.

The absorbent material 102 may be formed of synthetic fibers, including spunbonded, melt blown card and bind staple fibers; cellulosic fibers such as wood pulp, stabilized wood pulp, peat moss; and superabsorbents. Useful superabsorbents include polyacrylates; modified natural and regenerated polymers such as polysaccharides; hydrocolloids such as modified polyacrylonitrile compounds; cross-linked nonionic polymers such as polyoxyethylene, polyoxypropylene and mixture thereof; derivatives of isobutylene-maleic anhydride copolymers; copolymers such as those disclosed in Le-Khac, U.S. Patent Nos. 4,731,067; 4,743,244;

4,788,237; 4,813,945; 4,880,868; 4,892,533; and 5,151,465.

Preferably, the absorbent material 102 is a superabsorbent, more preferably, it is a superabsorbent powder, and most preferably, the absorbent material 102 is a particulate sodium polyacrylate superabsorbent, Aqua Keep J-550, available from Sumitomo Seika Chemical Company, Ltd. The absorbent material 102 can be applied to the moving web as necessary to provide the desired amount of absorbent material 102 to the resulting individual pads. Preferably, the absorbent material 102 is applied at about 100 to 1,000 mg/pad, more preferably about 200 to 800 mg/pad, and most preferably at about 400 to 600 mg/pad.

The barrier layer 112 may be formed of any barrier film useful in the disposable absorbent product art. Useful films include, without limitation, polyolefin-films such as polyethylene and polypropylene; polyvinyl films such as polyvinyl acetate, polyvinyl chloride, and polyvinylidene chloride; copolymeric films such as ethylene-vinyl acetate, and blends or laminates of one or more of the above polymers. Preferred barrier films include ethylene-vinyl acetate/polyethylene laminate films and polypropylene films. More preferably, the barrier film is a polyolefin such as polyethylene.

The selection of construction adhesive 110 and positioning adhesive 114 is not critical to the practice of the present invention. These adhesives may independently be chosen from solvent-releasing, e.g., emulsion or organic solvent based; curing, e.g., radiation cure, electron beam, or catalytic cure; or hot melt. Preferred adhesives include hot melt adhesives which may also be pressure sensitive adhesives (PSA). A representative, non-limiting list of useful adhesives

includes those based on natural rubber, styrene/butadiene latex, A-B-A block copolymer, butyl rubber and polyisobutylene, acrylics including vinyl acetate-acrylate copolymers, vinyl ether polymers, polyalkene polymers, polyurethane, ethylene-vinyl acetate copolymers and polypropylene including atactic polypropylene. Preferably, the adhesive is an A-B-A block copolymer, an acrylic resin, or an ethylene-vinyl acetate copolymer. More preferably, the construction adhesive is based on an A-B-A block copolymer hot melt adhesive, such as National Starch #34-5539, and the positioning adhesive is an A-B-A block copolymer hot melt adhesive, such as H.B. Fuller Co. HL-1335.

The adhesive can be applied to the absorbent pad in any manner known to the ordinary practitioner. Such application methods include, without limitation, spraying, transfer coating, roll coating, slot coating, gravure rolling, etc.

Referring now to Figs. 7-8, there is illustrated a laminated absorbent product 200 having an absorbent material 202 distributed therein. The absorbent product 200 includes an absorbent structure 204 having a cover layer 206, a fibrous layer 208, and a construction adhesive 210. The absorbent structure 204 may be laminated to a barrier layer 212 having a positioning adhesive 214 disposed upon a garment-facing surface 216 thereof. The positioning adhesive 214 may be protected by a release liner 218.

At the peripheral edges 220 of the product 200, there is a densified area 222. This area 222 is substantially absorbent material-free. It can be seen that the absorbent material 202 is fully contained within the absorbent product 200 by the cover layer 206, the barrier layer 212, and the densified areas 222.

This reduces loss of the generally expensive absorbent material 202 during the processing, shipping, and handling of the products 200 prior to use.

The fibrous substrate 204, cover layer 206, fibrous layer 208, barrier layer 212, absorbent material 202, positioning adhesive 214, and construction adhesive 210 may be selected from the materials listed above.

The specification and embodiments above are presented to aid in the complete and non-limiting understanding of the invention disclosed herein. Since many variations and embodiments of the invention can be made without departing from its spirit and scope, the invention resides in the claims hereinafter appended.

WHAT IS CLAIMED IS:

1. A laminated absorbent structure having reduced delamination tendencies comprising:

a) a fibrous substrate having a first major surface and a second major surface, opposite the first, the second major surface defined by a cover layer;

b) an adhesive composition adhered to at least a portion of the first major surface of the fibrous substrate; and

c) an absorbent material which is at least partially immobilized by the adhesive composition and which is disposed in a pattern to form at least one discrete absorbent material-containing zone which occupies less than 100% of the first major surface of the fibrous substrate and at least one absorbent material-free zone;

wherein the absorbent material is contained within the absorbent structure by at least the cover layer. .

2. The structure of claim 1 further comprising at least one peripheral densification of the fibrous substrate in the at least one absorbent material-free zone

3. The structure of claim 1 wherein the fibrous substrate is folded upon itself, thereby providing an outer surface of the cover layer.

4. The structure of claim 1 wherein a containing layer overlies the first major surface and absorbent material to contain the absorbent material.

5. The structure of claim 4 wherein the containing layer comprises a nonwoven layer.

6. The structure of claim 4 wherein the containing layer comprises a barrier layer.

7. The structure of claim 1 wherein the absorbent material is disposed in a pattern to form absorbent material-free zones in interior portions of the first major surface of the fibrous substrate.

8. The structure of claim 1 wherein the absorbent material is a particulate superabsorbent polymer.

9. The structure of claim 1 wherein the absorbent material is a fibrous superabsorbent polymer.

10. The structure of claim 9 wherein the fibrous superabsorbent polymer has fibers less than about 1 cm in length.

11. A laminated absorbent product having reduced delamination tendencies comprising:

a) a laminated absorbent structure having longitudinal ends, a longitudinal axis, and lateral sides and comprising:

i) a fibrous substrate having a first major surface and a second major surface, opposite the first, the second major surface defined by a cover layer;

ii) an adhesive composition adhered to at least a portion of the first major surface of the fibrous substrate; and

iii) an absorbent material which is at least partially immobilized by the adhesive composition and which is disposed in a pattern to form at least one discrete absorbent material-containing zone which occupies less than 100% of the first major surface of the fibrous substrate and at least one absorbent material-free zone located at each longitudinal end; wherein the lateral sides of the fibrous substrate are folded parallel to the longitudinal axis to contain the absorbent material, to provide an outer surface of the cover layer, and to form the absorbent structure;

b) a barrier layer attached to a portion of the outer surface of the absorbent structure; and

c) longitudinal end seals wherein at least the absorbent material-free zone of the absorbent structure is densified to further contain the absorbent material within the absorbent structure.

12. A continuous process for forming a laminated absorbent structure having reduced delamination tendencies comprising the steps of:

a) providing a moving fibrous substrate having lateral sides, a longitudinal axis, a first major surface, and a second major surface, opposite the first, the second major surface defined by a cover layer;

b) providing a pressure differential across the moving fibrous substrate, wherein fluid pressure acting on the first major surface is greater than the fluid pressure acting on the

second major surface, thereby drawing air through the fibrous substrate;

c) masking at least a portion of the second major surface to air flow;

d) providing a metered amount of an absorbent material to the first major surface in a pattern corresponding to the unmasked portion of the second major surface; and

e) densifying at least a portion of the fibrous substrate corresponding to the masked portion to laterally contain the absorbent material within the resulting absorbent structure.

13. The process of claim 12 wherein the metered amount of the absorbent material is provided in an airstream.

14. The process of claim 12 further comprising the step of folding the fibrous substrate upon itself to provide an outer surface of the cover layer.

15. The process of claim 14 wherein the lateral sides of the fibrous substrate are folded parallel to the longitudinal axis to contain the absorbent material and to provide an outer surface of the cover layer.

16. The process of claim 12 further comprising the step of placing a containing layer over the first major surface to contain the absorbent material.

17. The process of claim 12 further comprising applying an adhesive composition to at least a portion of the first major surface of the fibrous substrate.

18. The process of claim 16 wherein the adhesive composition is applied to the substrate before the application of the absorbent material.

19. A continuous process for forming a laminated absorbent product having reduced delamination tendencies comprising the steps of:

a) providing a moving fibrous substrate having lateral sides, a longitudinal axis, a first major surface, and a second major surface, opposite the first, the second major surface defined by a cover layer;

b) applying an adhesive composition to at least a portion of the first major surface of the fibrous substrate;

c) providing a pressure differential across the moving fibrous substrate, wherein fluid pressure acting on the first major surface is greater than the fluid pressure acting on the second major surface, thereby drawing air through the fibrous substrate;

d) masking at least a portion of the second major surface corresponding to longitudinal product ends to air flow;

e) providing a metered amount of an absorbent material to the first major surface in a pattern corresponding to the unmasked portion of the second major surface;

f) folding the lateral sides of the fibrous substrate parallel to the longitudinal axis to contain the absorbent material, to provide an outer surface of the cover layer, and to provide an absorbent structure;

g) attaching a barrier layer to one surface of the absorbent structure;

h) densifying at least a portion of the fibrous substrate corresponding to the masked portion to laterally contain the absorbent material within the absorbent structure; and

i) separating individual laminated absorbent products at their longitudinal ends, leaving a densified portion at the longitudinal end of each product.

Abstract of the Disclosure

The present invention utilizes the smooth continuous motion of a masking belt to concentrate air-entrained absorbent materials on the surface of a moving fibrous substrate. Air flowing through the open areas of the masking belt carries the entrained material into the fibrous web. The fibrous web acts as a filter to separate the entrained material from the air stream. Substantially all dispensed material is captured by the fibrous web, and expensive and complex absorbent material recycle systems can be eliminated.

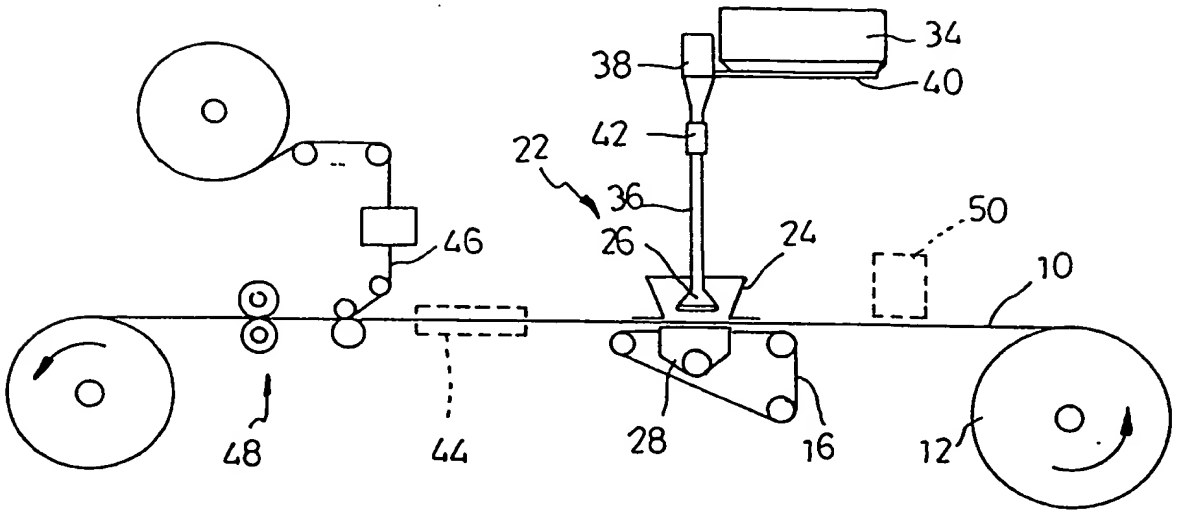
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FIG-1

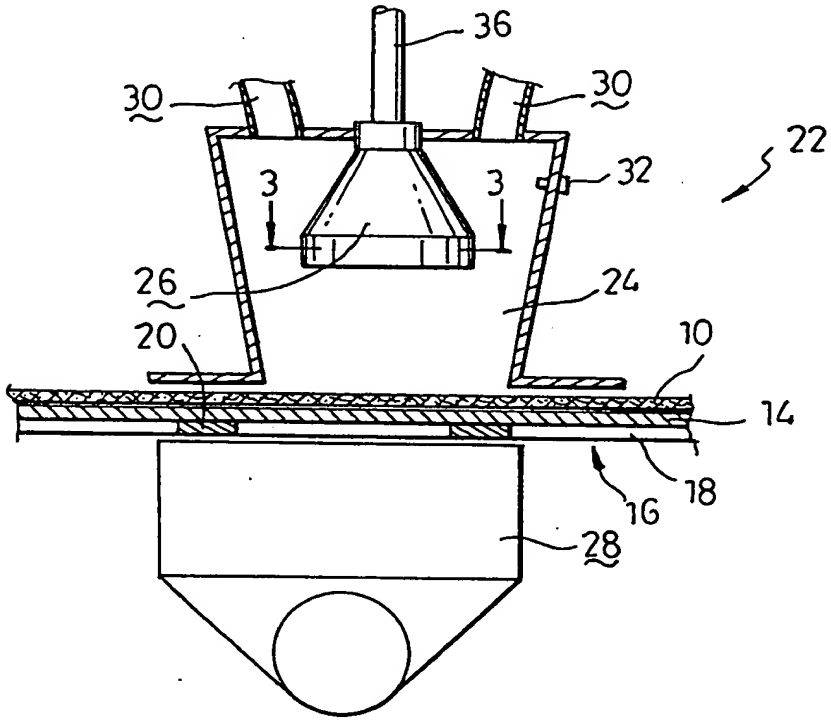
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FIG-2

FIG. 4.

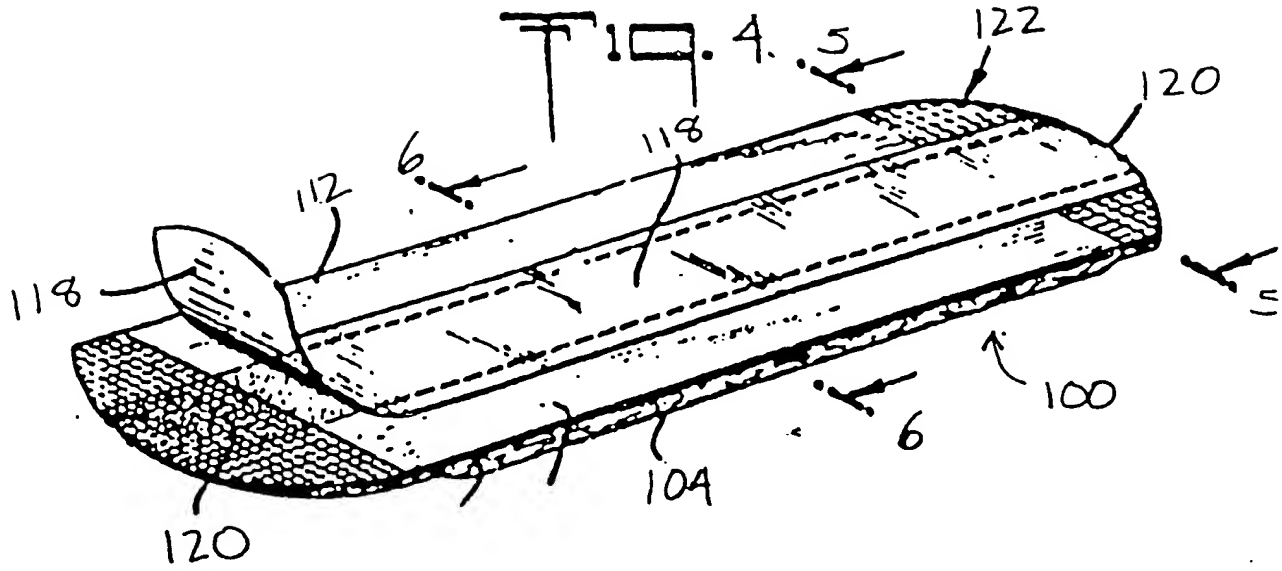

FIG. 5

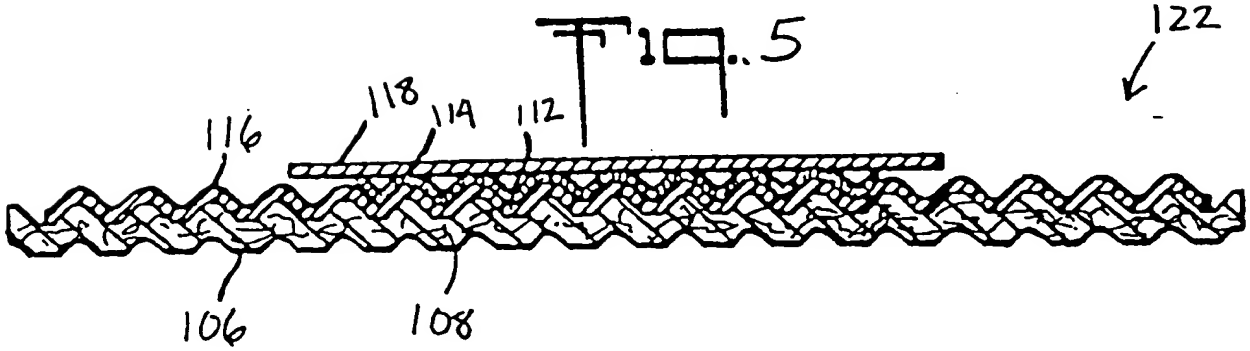

FIG. 6

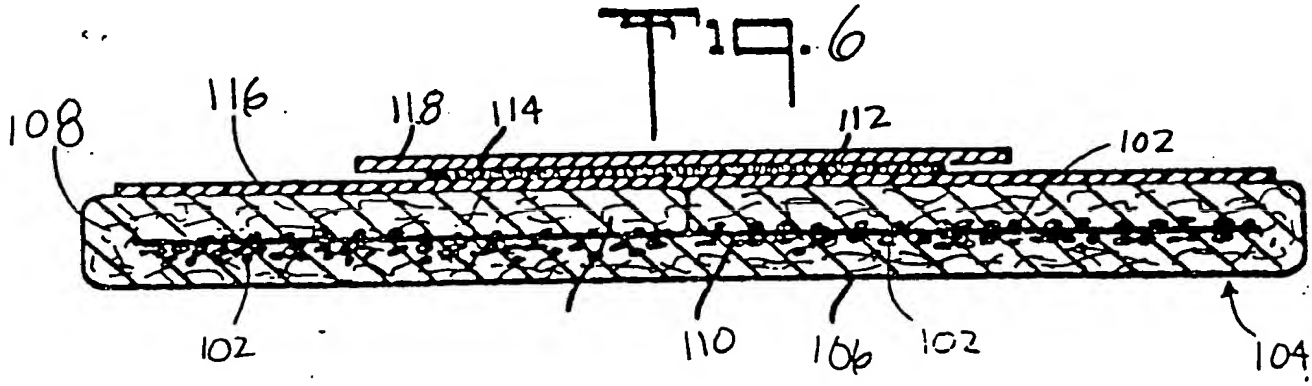

Fig. 7

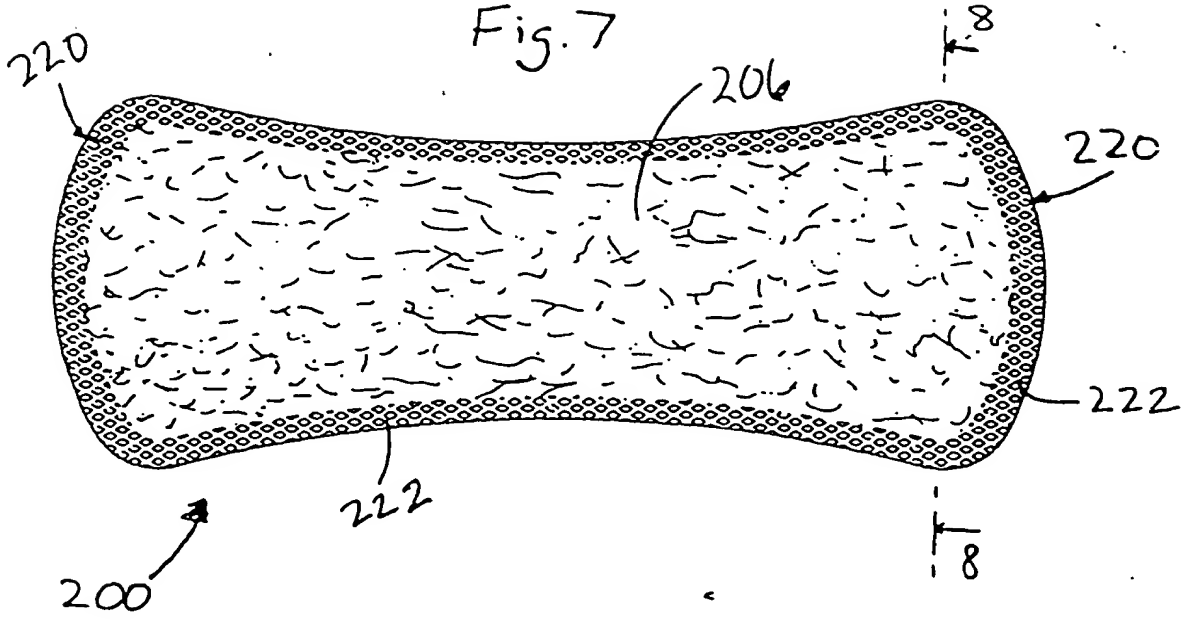

Fig. 8

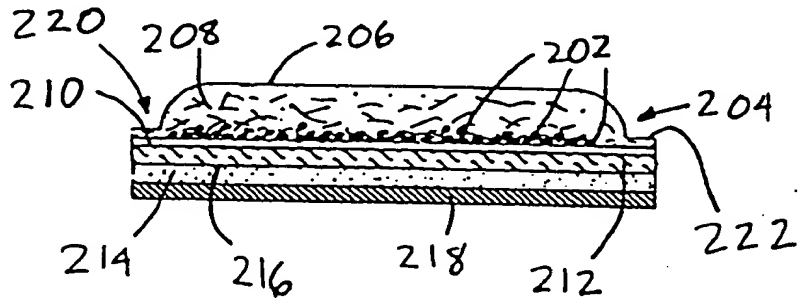

Fig. 3